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APPLICANT : NGK SPARK PLUG CO LTD;

INVENTOR : KURASAWA TAKASHI;

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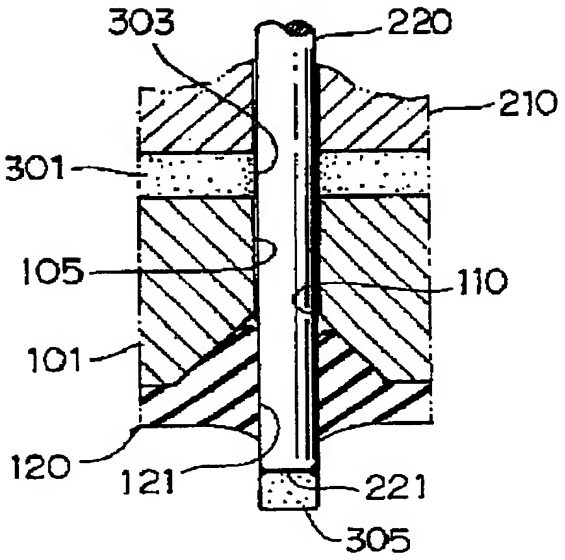
TITLE : METHOD FOR SEPARATING PUNCH CHIP FROM PUNCH PIN AND DIE USED THEREFOR



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SOLUTION: A silicone rubber layer 120 having a through part 121 capable of passing a punch pin 220 with its tip in an expanding manner is attached to a discharge side opening part 110 of punch chips in a punch pin receiving hole 105 of a die 101 on which a green sheet 301 is placed. When the punch pin 220 punches a via hole 303, its tip 221 passes the through part 121 of the silicone rubber layer 120. During the punching by the punch pin 220, chips 305 adhered to a tip 221 are subjected to the shrinking effect at the through part 121 of the silicone rubber layer 120, and separated in the retracting process of the pin 220.

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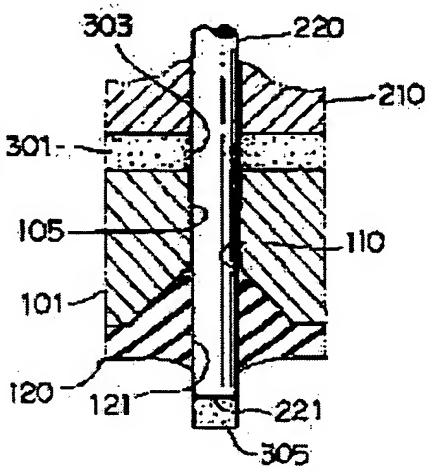
(71)Applicant : **NGK SPARK PLUG CO LTD**
(72)Inventor : **KURASAWA TAKASHI**

(54) METHOD FOR SEPARATING PUNCH CHIP FROM PUNCH PIN AND DIE USED THEREFOR

(57)Abstract:
PROBLEM TO BE SOLVED: To efficiently treat punch chips generated in punching a via hole in a green sheet.
SOLUTION: A silicone rubber layer 120 having a through part 121 capable of passing a punch pin 220 with its tip in an expanding manner is attached to a discharge side opening part 110 of punch chips in a punch pin receiving hole 105 of a die 101 on which a green sheet 301 is placed. When the punch pin 220 punches a via hole 303, its tip 221 passes the through part 121 of the silicone rubber layer 120. During the punching by the punch pin 220, chips 305 adhered to a tip 221 are subjected to the shrinking effect at the through part 121 of the silicone rubber layer 120, and separated in the retracting process of the pin 220.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] this invention is based on the ceramic green sheet at a punch pin (pin-like punch) in processing of the ceramic green sheet (ceramic student substrate) which forms a ceramic multilayer-interconnection substrate etc. -- piercing (punching) -- it is related with the technique of separating the blanking waste generated in case a beer hall is punched from a punch pin.

[Translation done.]

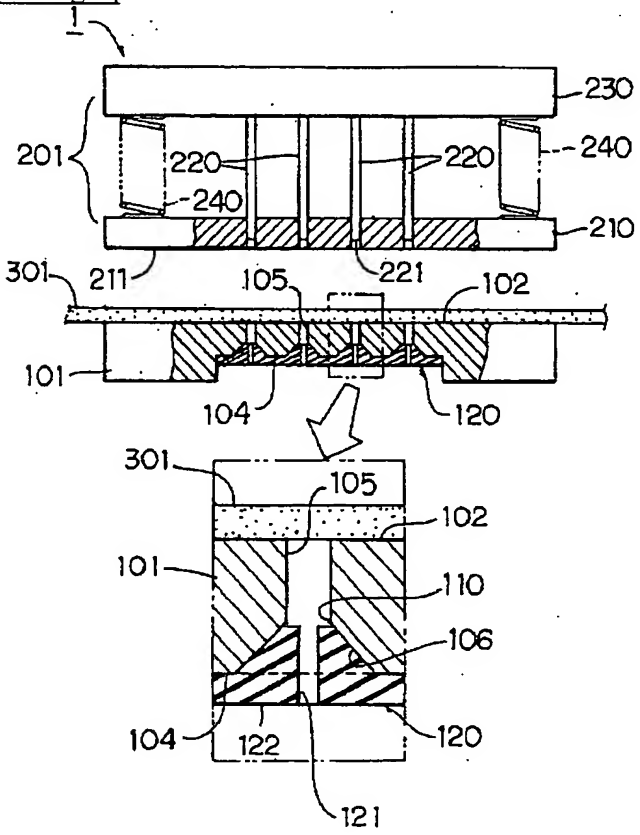
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The outline configuration sectional view and its important section enlarged drawing of the beer hall blanking punch which materialized this invention.
[Drawing 2] The outline configuration sectional view which explains the blanking process of a beer hall in drawing 1 .
[Drawing 3] The outline configuration sectional view in the condition of having pierced the beer hall in drawing 1 .
[Drawing 4] The important section enlarged drawing of drawing 2 .
[Drawing 5] The important section enlarged drawing of drawing 3 .
[Drawing 6] The important section enlarged drawing when drawing out a punch pin.
[Drawing 7] The important section enlarged drawing when drawing out a punch pin.
[Drawing 8] The outline configuration sectional view of the conventional beer hall blanking punch.
[Drawing 9] The outline configuration sectional view in the condition of having pierced the beer hall in drawing 7 .
[Description of Notations]
101 Die
105 Punch Pin Acceptance Hole
110 Discharge Side Opening
120 Rubber-like Elasticity Object (Silicone Rubber Layer)
121 Penetration Section
220 Punch Pin
221 Tip of Punch Pin
301 Green Sheet
303 Beer Hall
305 Blanking Waste

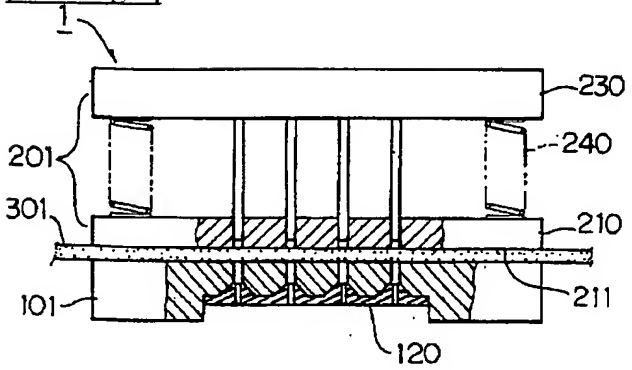
[Translation done.]

DRAWINGS

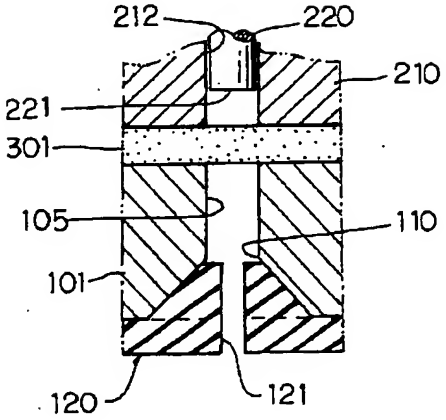
[Drawing 1]



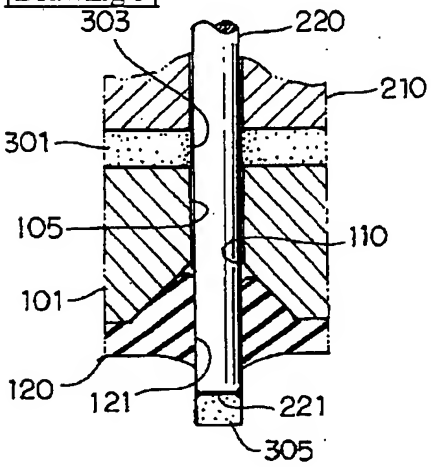
[Drawing 2]



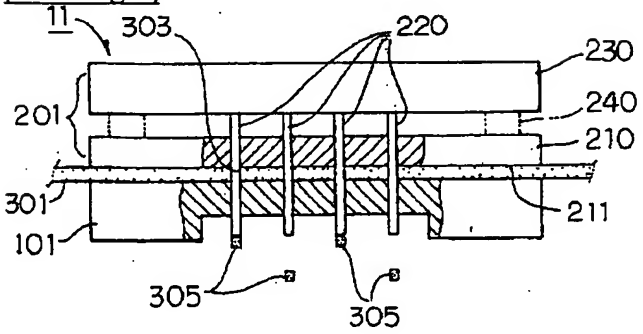
[Drawing 4]



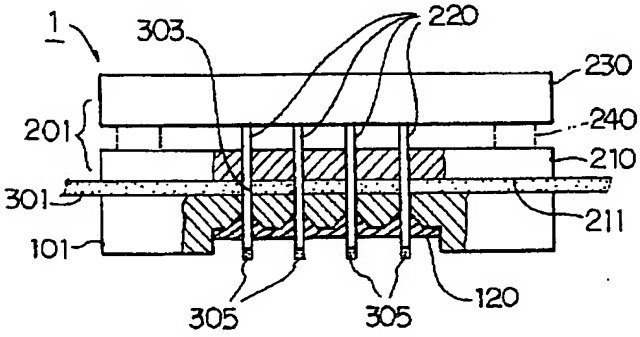
[Drawing 5]



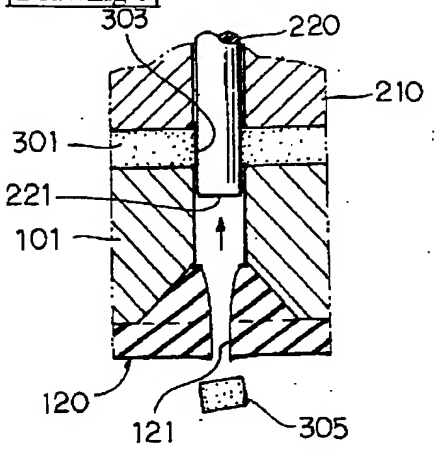
[Drawing 9]



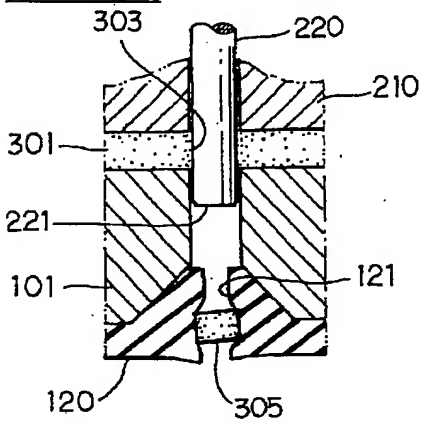
[Drawing 3]



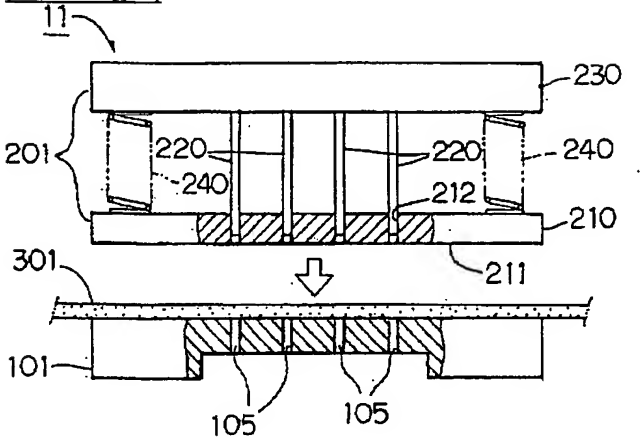
[Drawing 6]



[Drawing 7]



[Drawing 8]



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CLAIMS

[Claim(s)]
[Claim 1] In the approach of punching a beer hall by blanking by the punch pin at a green sheet To discharge side opening of the blanking waste in the punch pin acceptance hole of the die on which a green sheet is put While attaching the rubber-like elasticity object equipped with the penetration section which can pass as the tip of said punch pin extended When said punch pin pierces a beer hall, pass the punch pin acceptance hole of said die, and the tip of this punch pin enters into the penetration section of said rubber-like elasticity object, or it is made to pass this penetration section. The blanking waste which has adhered at the tip of this punch pin at the time of blanking by said punch pin The separation approach from the punch pin of the blanking waste characterized by making it dissociate from the tip of this punch pin according to a contraction operation of this rubber-like elasticity object in the penetration section of said rubber-like elasticity object at the time of retreat of this punch pin.
[Claim 2] The die characterized by being the die on which it is used for a green sheet by blanking by the punch pin punching a beer hall, and the green sheet is put, and coming to attach the rubber-like elasticity object equipped with the penetration section which can pass as the tip of said punch pin extended to discharge side opening of the blanking waste in the punch pin acceptance hole of the die.
[Claim 3] The die according to claim 2 said whose rubber-like elasticity object is silicone rubber.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] this invention is based on the ceramic green sheet at a punch pin (pin-like punch) in processing of the ceramic green sheet (ceramic student substrate) which forms a ceramic multilayer-interconnection substrate etc. -- piercing (punching) -- it is related with the technique of separating the blanking waste generated in case a beer hall is punched from a punch pin.
[0002]
[Description of the Prior Art] the ceramic multilayer-interconnection substrate which makes a ceramic IC package etc. is formed by dividing ceramic green sheets (the following and a green sheet -- or it also only being called a sheet), such as an alumina, per substrate, after being stuck by pressure, considering as a non-calcinated wiring substrate (the so-called oban) and calcinating this, a laminating and. Such a non-calcinated wiring substrate is manufactured by the laminating and stuck by pressure in the green sheet with which much non-calcinated beer and a non-calcinated wiring layer were formed. and -- this green sheet -- usually -- plane view (cross section) -- many through tubes (through hole) called circular beer hall are opened, this beer hall is filled up with the metallizing paste or metallizing ink (henceforth conductive paste) which uses refractory metal powder, such as W (tungsten) and Mo (molybdenum), as a principal component, the conductive paste for internal wiring layers is further screen-stenciled to a sheet surface (only henceforth printing), and it is sent to a laminating and a sticking-by-pressure process.
[0003] By the way, among such processing processes of a green sheet, in punching (perforation) of a beer hall, the sheet (usually one sheet) is put on a die (female mold), and, usually it is performed by blanking by the punch pin (punch). drawing 8 is an outline configuration (** type) sectional view explaining such a conventional beer hall blanking punch (the following and a punch -- or it is also only called equipment) 11.
[0004] This equipment 11 consists of a die 101 on which a sheet 301 is put, punch pin equipment 201 which moves up and down on it. It is prepared in the shape of penetration so that the punch pin acceptance hole (punch pin fitting hole) 105 which it pierces [hole] to it at the same time it makes a die 101 pierce the punch pin 220, and makes it discharge waste (punch dregs) may correspond to arrangement of the beer hall of a sheet 301. And punch pin equipment 201 consists of a stripper 210, many punch pins 220, etc. which press down a green sheet 301. That is, the punch pin 220 fixes so that it may correspond to the pin anchoring plate 230 through the upper limit section at arrangement of the beer hall of a sheet 301, and it is joined with a stripper 210 through a coil spring 240, and the pin anchoring plate 230 is constituted so that the punch pin 220 may slide the inside of a stripper's 210 punch pin guide hole 212 through a coil spring 240 (vertical movement). And such punch pin equipment 201 is constituted so that it may move up and down in one through the guide equipment and the press driving gear which are not illustrated.

[0005] In order to punch a beer hall with such a punch 11, a sheet 301 is positioned and put on the top face of a die 101, and lower ** (henceforth advance) of the pin anchoring plate 230 is carried out so that punch pin equipment 201 may be dropped. Then, a coil spring 240 is compressed and many beer halls 303 are pierced at once by the punch pin 220 at the same time a sheet 301 is pressed down on a stripper's 210 inferior surface of tongue 211, as shown in drawing 9 . Under the present circumstances, the blanking waste 305 pierced by the configuration at the tip (cross section) of each punch pin 220 is stuffed into the punch pin acceptance hole 105 with the punch pin 220, and is discharged from opening for discharge (fall) of that bottom. And after a punch is carrying out upper ** (henceforth retreat) of the pin installation plate 230, a pin 220 is pulled out from a sheet 301 under the condition of having pressed down the sheet 301 by the stripper 210, and punch pin equipment 201 returns to a former location (refer to drawing 8).

[0006]

[Problem(s) to be Solved by the Invention] In case a beer hall is punched using the above mentioned conventional equipment, the part of the pierced sheet 301 serves as blanking waste 305 (only henceforth waste), and by discharge side opening to self-weight, from the tip of a pin 220, it dissociates and it falls. However, when blanking waste 305 adhered, and did not dissociate at the tip of the punch pin 220, but it carried out upper ** (lift) of the plate 230 for pin anchoring and pulled out the pin 220 from the sheet 301, it might pierce at the retreat (return) process, and waste 305 might be lifted together with the punch pin 220.

[0007] When there was lifting of such blanking waste 305, there was a problem of the waste 305 adhering to the inside of the punch pin acceptance hole 105, or fitting in so that it may be caught in the punched beer hall 303, or adhering, and starting hole plugging. Moreover, even if it started neither such adhesion nor hole plugging, there was also a problem that blanking waste 305 will pass through the inside of the beer hall 303 of a sheet 301 together with the punch pin 220, and will be lifted. That is, the waste 305 will remain in a stripper's 210 punch pin guide hole 212 at such a case, as adhered [at the tip of the punch pin 220]. Therefore, at the time of punching of the sheet processed into a degree, since the tip of a pin 220 collided with the sheet through the blanking waste 305, the serious problem of the beer hall considered as a request not being punched at a sheet, or bending, since the punch pin is as long as the diameter of about 100 micrometers thin moreover might occur.

[0008] The cause of fundamental of such a problem is to pierce fundamentally and for waste 305 to tend to adhere at the tip, when the sheet which is a briquette by resin, is viscous and has such viscosity pierces ceramic powder and a green sheet 301 is sometimes pushed strongly at the tip of the punch pin 220. Thus, when punching a beer hall conventionally at a green sheet, blanking waste adhered at the tip of a punch pin, the smooth separation and discharge were not performed, but there was a problem that the fall of the production yield of a green sheet and the dependability of a wiring substrate were reduced as a result.

[0009] The technique of carrying out the processing by the thing which adhered at the tip of a punch pin and which it pierces, and waste is pierced and is done for vacuum suction immediately after, and the technique of blowing away with air the blanking waste which has adhered further are known to such a problem. However, by the technique of carrying out vacuum suction, although larger blanking waste is easy to be attracted, smaller waste is hard to be attracted and it does not serve as a fundamental solution of the aforementioned problem. Moreover, although the separation and discharge can be carried out by aiming at the attachment site and spraying air by the technique to blow away when the number of punch pins is a fraction, in a green sheet with the need of piercing a beer hall hundreds or thousands or more, there are many punch pins and the complete treatment is difficult. Furthermore, he is fastidious, and equipment will be complicated considering a result and the technique of ******** will also cause increase of cost.

[0010] It is shown in having accomplished this invention in view of such a trouble, and it processing efficiently the blanking waste generated in case blanking punches a beer hall at a green sheet, as a

result aiming at improvement in productivity.

[0011]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the separation approach from the punch pin of the blanking waste of this invention In the approach of punching a beer hall by blanking by the punch pin at a green sheet To discharge side opening of the blanking waste in the punch pin acceptance hole of the die on which a green sheet is put While attaching the rubber-like elasticity object equipped with the penetration section which can pass as the tip of said punch pin extended When said punch pin pierces a beer hall, pass the punch pin acceptance hole of said die, and the tip of this punch pin enters into the penetration section of said rubber-like elasticity object, or it is made to pass this penetration section. It is characterized by making it separate the blanking waste which has adhered at the tip of this punch pin at the time of blanking by said punch pin from the tip of this punch pin according to a contraction operation of this rubber-like elasticity object in the penetration section of said rubber-like elasticity object at the time of retreat of this punch pin.

[0012] When the tip of a punch pin passes a punch pin acceptance hole and it is made to have passed the penetration section of a rubber-like elasticity object further, for example according to the approach of this invention (i.e., when making it have passed the penetration section of a rubber-like elasticity object at the time of the maximum descent at this tip), the tip projects from the penetration section of a rubber-like elasticity object at the time of blanking (it jumps out). Under the present circumstances, when it pierces at that tip and waste has adhered, that waste also passes the penetration section of said rubber-like elasticity object, and projects. Since it has passed at this time as the punch pin extended the penetration section of said rubber-like elasticity object, it is extracted in the contraction (becoming narrower) operation by that elasticity. therefore , although the tip of a pin tend to enter into the penetration section of a rubber-like elasticity object in case a punch pin be retreat under this condition (drawing out) , by reach the edge of the penetration section of said rubber-like elasticity object , as resistance by narrowing down operation of a rubber-like elasticity object be receive and it be rub off relatively , it dissociate from this tip , and the blanking waste which have adhere at the tip fall .

[0013] And without following retreat of a punch pin as it is, since it will be extracted in that contraction operation even if blanking waste enters into the penetration section with a pin in this retreat, it dissociates into it and the blanking waste and coincidence at the time of blanking of the following sheet extrude.

[0014] What is necessary is to pass the punch pin acceptance hole of said die, and for the tip of a punch pin to enter into the penetration section of said rubber-like elasticity object, or just to make it have passed this penetration section in this invention. This means that you may be the case where it gets down only to the middle, without the tip of a pin passing the penetration section of a rubber-like elasticity object at the time of the maximum descent. Because, the blanking waste which has adhered at the tip at the time of descent of a punch pin also in such a case receives the contraction (narrowing down) operation with a punch pin in the penetration section of said rubber-like elasticity object. Therefore, as described above under this condition, when a punch pin retreats, it pierces according to this operation and waste is for dissociating in it, without following retreat of a punch pin as it is. In addition, the separated waste is extruded and discharged by coincidence at the time of blanking of the following sheet.

[0015] And the die by which it is used for punching a beer hall by the green sheet, and the green sheet is put on it by blanking by the punch pin concerning this invention comes to attach the rubber-like elasticity object which equipped it with the penetration section which can pass as the tip of said punch pin extended to discharge side opening of the blanking waste in the punch pin acceptance hole of the die. When a punch pin pierces the beer hall of a green sheet, in a beer hall blanking punch, using said die namely, the tip of this punch pin The blanking waste which has adhered at the tip of this punch pin at the time of blanking by said punch pin by passing the punch pin acceptance hole of said die,

entering into the penetration section of said rubber-like elasticity object, or making it pass this penetration section is the above, and is made and separated.
[0016] in addition, the break of radials, such as plane view (cross section) which is carrying out opening in the free condition that what is necessary is just to be able to pass it as the tip of a punch pin extends the penetration section, which circular through tube or the shape of a straight line, and a cross-joint configuration, -- in addition, the through tube and break which are blockaded in the free condition are sufficient. There should just be a moderate contraction operation so that the blanking waste which has adhered at the tip of a punch pin can dissociate from the tip in the retreat (upper **) process, i.e., the return process, of a punch pin according to a contraction operation of the rubber-like elasticity object. A resin object with a degree of hardness similar to such rubber and elasticity shall be included in this that what is necessary is to choose from the rubber which has a moderate degree of hardness and elasticity in the rubber-like elasticity object in this invention, and just to use.
[0017]
[Embodiment of the Invention] Now, the example of an operation gestalt which starts this invention next is explained to a detail with reference to drawing 1 -6. Drawing 1 -3 are the outline configuration sectional view of the beer hall blanking punch 1 which materialized this invention, and drawing 4 -6 are the important section enlarged drawing explaining a blanking process. This equipment 1 consists of a die 101 of the fixed bottom, and punch pin equipment 201 which moves up and down on it, and punch pin equipment 201 consists of a stripper 210, many punch pins (pin-like punch) 220, etc. which press down a green sheet 301.
[0018] The top face 102 is formed evenly, a die 101 is made into the field on which a green sheet 301 is positioned and put, and the flat crevice 104 is established in the inferior-surface-of-tongue side. And according to the design of a green sheet 301, the punch pin acceptance hole 105 which it pierces [hole] at the same time it makes the punch pin 220 pierce, and makes waste discharge penetrates in the part corresponding to a beer hall of a top face 102 up and down, and are prepared in it. [many] Let the punch pin acceptance hole 105 be the magnitude (diameter) which can be slid without a backlash corresponding to the diameter of each punch pin 220. However, it is formed so that the lower limit section of this punch pin acceptance hole 105 may make the countersinking-like taper section 106 in this example, and the minor diameter end face section of that taper section 106 pierces, and it considers as the trashy discharge side opening 110.
[0019] In this example, the silicone rubber layer 120 is attached in the crevice 104 of the inferior surface of tongue of a die 101 as a rubber-like elasticity object including this countersinking-like taper section 106. However, in this example, the penetration section (a through tube or break) 121 smaller than the tip (cross section) 221 of the punch pin 220 is formed in the location corresponding to the plane view (bottom face view) of the silicone rubber layer 120, and the discharge side opening 110 in the free condition. By this example, the rubber layer 120 is attached by making predetermined thickness apply and dry ****** style type liquefied silicone rubber (adhesion), it is after the attachment and the penetration section [a little] 121 smaller than the tip (field) 221 of a pin 220 is formed by ******(ing) the punch pin 220. In addition, it is because it contracts in the free condition after a punch since it is extended and pierced so that it may be depressed caudad, in case the tip 221 of a pin 220 will collide with silicone rubber, if it ****** in this way that a little penetration section 121 smaller than the tip 221 of a pin 220 at this ****** can be formed, and it becomes small. In this way, the penetration section 121 is formed so that it may pass, as the tip 221 of the punch pin 220 extends.
[0020] On the other hand, the punch pin 220 which constitutes punch pin equipment 201 fixes so that it may correspond to the pin anchoring plate 230 through the upper limit section at arrangement of the beer hall of a sheet 301, and it is joined with a stripper 210 through a coil spring 240, and the pin anchoring plate 230 is constituted so that the punch pin 220 may slide the inside of a stripper's 210 punch pin guide hole 212 through a coil spring 240 (vertical movement). And such punch pin equipment 201 is constituted so that it may move up and down in one through the guide equipment

and the press driving gear which are not illustrated.

[0021] In addition, in this example, when punch pin equipment 201 is located in upper limit, the space for the set of a green sheet 301 is secured between a stripper's 210 inferior surface of tongue 211, and the top face 102 of a die 101. Moreover, before carrying out lower ** (advance) of the punch pin equipment 201 (before punching), the tip (lower limit) 221 of the punch pin 220 is set up so that it may be located more nearly up than a stripper's 210 inferior surface of tongue 211. And if punch pin equipment 201 is lower-**(ed), the top face of the green sheet 301 set to the top face 102 of a die 101 on a stripper's 210 inferior surface of tongue 211 will be pressed down, a beer hall 303 will be pierced by coincidence in lower ** (advance) of the punch pin 220, but when the punch pin 220 is in the lowest edge, the tip 221 is set up so that a predetermined dimension protrusion may be carried out from the inferior surface of tongue 122 of the silicone rubber layer 120.

[0022] In order to punch a beer hall with such a punch, a sheet 301 is set to the top face 102 of a die 101 (positioning installation), and it lower-** so that punch pin equipment 201 may be dropped. Then, a coil spring 240 is compressed, and as shown in drawing 3 and 5, many beer halls 303 are pierced by the punch pin 220, at the same time a sheet 301 is pressed down on a stripper's 210 inferior surface of tongue 211, as shown in drawing 2 and 4. Under the present circumstances, as the penetration [in / by piercing waste 305 enters into the punch pin acceptance hole 105 with the punch pin 220, is extruded from the opening 110 for discharge (fall) of that bottom, and / the silicone rubber layer 120] section 121 pierced by the configuration at the tip (cross section) 221 of each punch pin 220 is extended with the tip of the punch pin 220, it passes.

[0023] As shown in drawing 5 at this time, when it pierces at the tip 221 of the punch pin 220 projected from the penetration section 121 of the silicone rubber layer 120 and waste 305 has adhered, the punch pin 220 is extracted in the contraction operation by that elasticity by the penetration section 121 of silicone rubber. Next, if upper ** (retreat) of the pin installation plate 230 is carried out under this condition, where a sheet 301 is pressed down by the stripper 210 this time, while a pin 220 is pulled out from a sheet 301, the lift of the punch pin equipment 201 will be carried out to a former location.

[0024] Although the tip 221 of a pin 220 tends to enter into the penetration section 121 of the silicone rubber layer 120 and tends to return to a former location when retreating (rise), upper ** 220, i.e., the punch pin, of this pin installation plate 230 By reaching the lower limit of the penetration section 121 of the silicone rubber layer 120, the blanking waste 305 which has adhered at the tip 221 is caught in resistance by the narrowing-down operation, or comes to be rubbed off relatively, and as shown in drawing 6 , from the tip 221 of a pin 220, it dissociates and it falls. That is, according to this example, even if it twists [adhere to the punch pin 220 separate and] and pierces and there is waste 305, separation fall can be automatically carried out at the retreat process of the punch pin 220. therefore, the hole of the beer hall [as / in the former] 303 -- it can prevent causing problems, such as plugging.

[0025] Even if it is raised a little and enters into the penetration section 121 of the silicone rubber layer 120 with a pin 220, without blanking waste 305 dissociating and falling in this way, the waste 305 will receive resistance by the rat tail and it in a contraction operation of the penetration section 121 of the silicone rubber layer 120. Therefore, without following retreat of the punch pin 220 as it is, as shown in drawing 7 in that case, since it dissociates and remains and only the punch pin 220 retreats in the penetration section 121, blanking waste 305 does not generate problems, such as hole plugging, in this case, either.

[0026] And at the time of punching of the following sheet 301, it extrudes together with the waste extruded at the tip 221 of the punch pin 220, and is separated by the contraction operation by the silicone rubber layer 120 the same with having described above in the retreat process of the pin 220 in that case, and the waste 305 which remains in this way falls. Thus, according to this example, it pierces at the retreat process of the punch pin 220 anyway, and problems, like waste 305 is caught in a beer hall 303 are not produced.

[0027] It is made to have not got down only to the middle in this invention so that I may be understood from having described above, without the tip 221 of the punch pin 220 passing the penetration section of rubber-like elasticity objects, such as a silicone rubber layer, at the time of the maximum descent (at the time of blanking). Even in such a case, it is because [which is not separated from the tip of a punch pin] it pierces and waste is not lifted as it is at the retreat process of a punch pin. But when a punch pin pierces a beer hall, it is desirable to make it the tip of this pin pass the penetration section of a rubber-like elasticity object. Moreover, it is desirable for the thickness of a rubber-like elasticity object to be also as large as possible, and to carry out. If thickness of a rubber-like elasticity object is enlarged, although it pierces at the retreat process of a pin and waste enters into the penetration section, it will pierce in it, waste will receive resistance for a long time, and it will be the part and because it is easy to dissociate.

[0028] In addition, although what pasted up and attached silicone rubber as a rubber-like elasticity object was illustrated in this example, in this invention, it is not limited to this. That is, it must be what can separate the blanking waste which has adhered at the tip of a pin in the elastic contraction operation thru/or a friction operation, and other rubber can be used. Moreover, you may be the resin object which has not only rubber but a moderate degree of hardness and elasticity as the above was also carried out.

[0029] Moreover, although wrote the rubber-like elasticity object as ****** style type liquefied silicone rubber, and it was made to paste up by making predetermined thickness apply and dry this and being attached with said gestalt, the rubber-like elasticity object which forms a solid-state is pasted up, or the proper fitting section is formed in a die, and as it fits in, you may attach. In addition, the penetration section may be prepared in any before and after attachment.

[0030]

[Effect of the Invention] According to this invention, processing of the blanking waste generated in case a beer hall is pierced to a green sheet and it is punched can be performed very efficiently, without requiring the equipment according to rank so that clearly from the above explanation. Improvement in the processing effectiveness of a green sheet thru/or productivity is achieved by this, without causing the rise of cost, extension of the life of a punch pin is achieved further upwards, and the dependability of a wiring substrate is also raised.

[Translation done.]

PRIOR ART

[Description of the Prior Art] the ceramic multilayer-interconnection substrate which makes a ceramic IC package etc. is formed by dividing ceramic green sheets (the following and a green sheet -- or it also only being called a sheet), such as an alumina, per substrate, after being stuck by pressure, considering as a non-calcinated wiring substrate (the so-called oban) and calcinating this, a laminating and. Such a non-calcinated wiring substrate is manufactured by the laminating and stuck by pressure in the green sheet with which much non-calcinated beer and a non-calcinated wiring layer were formed. and -- this green sheet -- usually -- plane view (cross section) -- many through tubes (through hole) called circular beer hall are opened, this beer hall is filled up with the metallizing paste or metallizing ink (henceforth conductive paste) which uses refractory metal powder, such as W (tungsten) and Mo (molybdenum), as a principal component, the conductive paste for internal wiring layers is further screen-stenciled to a sheet surface (only henceforth printing), and it is sent to a laminating and a sticking-by-pressure process.

[0003] By the way, among such processing processes of a green sheet, in punching (perforation) of a beer hall, the sheet (usually one sheet) is put on a die (female mold), and, usually it is performed by blanking by the punch pin (punch). drawing 8 is an outline configuration (** type) sectional view explaining such a conventional beer hall blanking punch (the following and a punch -- or it is also only called equipment) 11.

[0004] This equipment 11 consists of a die 101 on which a sheet 301 is put, punch pin equipment 201 which moves up and down on it. It is prepared in the shape of penetration so that the punch pin acceptance hole (punch pin fitting hole) 105 which it pierces [hole] to it at the same time it makes a die 101 pierce the punch pin 220, and makes it discharge waste (punch dregs) may correspond to arrangement of the beer hall of a sheet 301. And punch pin equipment 201 consists of a stripper 210, many punch pins 220, etc. which press down a green sheet 301. That is, the punch pin 220 fixes so that it may correspond to the pin anchoring plate 230 through the upper limit section at arrangement of the beer hall of a sheet 301, and it is joined with a stripper 210 through a coil spring 240, and the pin anchoring plate 230 is constituted so that the punch pin 220 may slide the inside of a stripper's 210 punch pin guide hole 212 through a coil spring 240 (vertical movement). And such punch pin equipment 201 is constituted so that it may move up and down in one through the guide equipment and the press driving gear which are not illustrated.

[0005] In order to punch a beer hall with such a punch 11, a sheet 301 is positioned and put on the top face of a die 101, and lower ** (henceforth advance) of the pin anchoring plate 230 is carried out so that punch pin equipment 201 may be dropped. Then, a coil spring 240 is compressed and many beer halls 303 are pierced at once by the punch pin 220 at the same time a sheet 301 is pressed down on a stripper's 210 inferior surface of tongue 211, as shown in drawing 9 . Under the present circumstances, the blanking waste 305 pierced by the configuration at the tip (cross section) of each punch pin 220 is stuffed into the punch pin acceptance hole 105 with the punch pin 220, and is discharged from

opening for discharge (fall) of that bottom. And after a punch is carrying out upper ** (henceforth retreat) of the pin installation plate 230, a pin 220 is pulled out from a sheet 301 under the condition of having pressed down the sheet 301 by the stripper 210, and punch pin equipment 201 returns to a former location (refer to drawing 8).

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, processing of the blanking waste generated in case a beer hall is pierced to a green sheet and it is punched can be performed very efficiently, without requiring the equipment according to rank so that clearly from the above explanation. Improvement in the processing effectiveness of a green sheet thru/or productivity is achieved by this, without causing the rise of cost, extension of the life of a punch pin is achieved further upwards, and the dependability of a wiring substrate is also raised.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] In case a beer hall is punched using the above mentioned conventional equipment, the part of the pierced sheet 301 serves as blanking waste 305 (only henceforth waste), and by discharge side opening to self-weight, from the tip of a pin 220, it dissociates and it falls. However, when blanking waste 305 adhered, and did not dissociate at the tip of the punch pin 220, but it carried out upper ** (lift) of the plate 230 for pin anchoring and pulled out the pin 220 from the sheet 301, it might pierce at the retreat (return) process, and waste 305 might be lifted together with the punch pin 220.
[0007] When there was lifting of such blanking waste 305, there was a problem of the waste 305 adhering to the inside of the punch pin acceptance hole 105, or fitting in so that it may be caught in the punched beer hall 303, or adhering, and starting hole plugging. Moreover, even if it started neither such adhesion nor hole plugging, there was also a problem that blanking waste 305 will pass through the inside of the beer hall 303 of a sheet 301 together with the punch pin 220, and will be lifted. That is, the waste 305 will remain in a stripper's 210 punch pin guide hole 212 at such a case, as adhered [at the tip of the punch pin 220]. Therefore, at the time of punching of the sheet processed into a degree, since the tip of a pin 220 collided with the sheet through the blanking waste 305, the serious problem of the beer hall considered as a request not being punched at a sheet, or bending, since the punch pin is as long as the diameter of about 100 micrometers thin moreover might occur.
[0008] The cause of fundamental of such a problem is to pierce fundamentally and for waste 305 to tend to adhere at the tip, when the sheet which is a briquette by resin, is viscous and has such viscosity pierces ceramic powder and a green sheet 301 is sometimes pushed strongly at the tip of the punch pin 220. Thus, when punching a beer hall conventionally at a green sheet, blanking waste adhered at the tip of a punch pin, the smooth separation and discharge were not performed, but there was a problem that the fall of the production yield of a green sheet and the dependability of a wiring substrate were reduced as a result.
[0009] The technique of carrying out the processing by the thing which adhered at the tip of a punch pin and which it pierces, and waste is pierced and is done for vacuum suction immediately after, and the technique of blowing away with air the blanking waste which has adhered further are known to such a problem. However, by the technique of carrying out vacuum suction, although larger blanking waste is easy to be attracted, smaller waste is hard to be attracted and it does not serve as a fundamental solution of the aforementioned problem. Moreover, although the separation and discharge can be carried out by aiming at the attachment site and spraying air by the technique to blow away when the number of punch pins is a fraction, in a green sheet with the need of piercing a beer hall hundreds or thousands or more, there are many punch pins and the complete treatment is difficult. Furthermore, he is fastidious, and equipment will be complicated considering a result and the technique of ******** will also cause increase of cost.
[0010] It is shown in having accomplished this invention in view of such a trouble, and it processing

efficiently the blanking waste generated in case blanking punches a beer hall at a green sheet, as a result aiming at improvement in productivity.
[0011]

[Translation done.]

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the separation approach from the punch pin of the blanking waste of this invention In the approach of punching a beer hall by blanking by the punch pin at a green sheet To discharge side opening of the blanking waste in the punch pin acceptance hole of the die on which a green sheet is put While attaching the rubber-like elasticity object equipped with the penetration section which can pass as the tip of said punch pin extended When said punch pin pierces a beer hall, pass the punch pin acceptance hole of said die, and the tip of this punch pin enters into the penetration section of said rubber-like elasticity object, or it is made to pass this penetration section. It is characterized by making it separate the blanking waste which has adhered at the tip of this punch pin at the time of blanking by said punch pin from the tip of this punch pin according to a contraction operation of this rubber-like elasticity object in the penetration section of said rubber-like elasticity object at the time of retreat of this punch pin.

[0012] When the tip of a punch pin passes a punch pin acceptance hole and it is made to have passed the penetration section of a rubber-like elasticity object further, for example according to the approach of this invention (i.e., when making it have passed the penetration section of a rubber-like elasticity object at the time of the maximum descent at this tip), the tip projects from the penetration section of a rubber-like elasticity object at the time of blanking (it jumps out). Under the present circumstances, when it pierces at that tip and waste has adhered, that waste also passes the penetration section of said rubber-like elasticity object, and projects. Since it has passed at this time as the punch pin extended the penetration section of said rubber-like elasticity object, it is extracted in the contraction (becoming narrower) operation by that elasticity. therefore , although the tip of a pin tend to enter into the penetration section of a rubber-like elasticity object in case a punch pin be retreat under this condition (drawing out) , by reach the edge of the penetration section of said rubber-like elasticity object , as resistance by narrowing down operation of a rubber-like elasticity object be receive and it be rub off relatively , it dissociate from this tip , and the blanking waste which have adhere at the tip fall .

[0013] And without following retreat of a punch pin as it is, since it will be extracted in that contraction operation even if blanking waste enters into the penetration section with a pin in this retreat, it dissociates into it and the blanking waste and coincidence at the time of blanking of the following sheet extrude.

[0014] What is necessary is to pass the punch pin acceptance hole of said die, and for the tip of a punch pin to enter into the penetration section of said rubber-like elasticity object, or just to make it have passed this penetration section in this invention. This means that you may be the case where it gets down only to the middle, without the tip of a pin passing the penetration section of a rubber-like elasticity object at the time of the maximum descent. Because, the blanking waste which has adhered at the tip at the time of descent of a punch pin also in such a case receives the contraction (narrowing down) operation with a punch pin in the penetration section of said rubber-like elasticity object.

Therefore, as described above under this condition, when a punch pin retreats, it pierces according to this operation and waste is for dissociating in it, without following retreat of a punch pin as it is. In addition, the separated waste is extruded and discharged by coincidence at the time of blanking of the following sheet.

[0015] And the die by which it is used for punching a beer hall by the green sheet, and the green sheet is put on it by blanking by the punch pin concerning this invention comes to attach the rubber-like elasticity object which equipped it with the penetration section which can pass as the tip of said punch pin extended to discharge side opening of the blanking waste in the punch pin acceptance hole of the die. When a punch pin pierces the beer hall of a green sheet, in a beer hall blanking punch, using said die namely, the tip of this punch pin The blanking waste which has adhered at the tip of this punch pin at the time of blanking by said punch pin by passing the punch pin acceptance hole of said die, entering into the penetration section of said rubber-like elasticity object, or making it pass this penetration section is the above, and is made and separated.

[0016] in addition, the break of radials, such as plane view (cross section) which is carrying out opening in the free condition that what is necessary is just to be able to pass it as the tip of a punch pin extends the penetration section, which circular through tube or the shape of a straight line, and a cross-joint configuration, -- in addition, the through tube and break which are blockaded in the free condition are sufficient. There should just be a moderate contraction operation so that the blanking waste which has adhered at the tip of a punch pin can dissociate from the tip in the retreat (upper **) process, i.e., the return process, of a punch pin according to a contraction operation of the rubber-like elasticity object. A resin object with a degree of hardness similar to such rubber and elasticity shall be included in this that what is necessary is to choose from the rubber which has a moderate degree of hardness and elasticity in the rubber-like elasticity object in this invention, and just to use.

[0017]

[Embodiment of the Invention] Now, the example of an operation gestalt which starts this invention next is explained to a detail with reference to drawing 1 -6. Drawing 1 -3 are the outline configuration sectional view of the beer hall blanking punch 1 which materialized this invention, and drawing 4 -6 are the important section enlarged drawing explaining a blanking process. This equipment 1 consists of a die 101 of the fixed bottom, and punch pin equipment 201 which moves up and down on it, and punch pin equipment 201 consists of a stripper 210, many punch pins (pin-like punch) 220, etc. which press down a green sheet 301.

[0018] The top face 102 is formed evenly, a die 101 is made into the field on which a green sheet 301 is positioned and put, and the flat crevice 104 is established in the inferior-surface-of-tongue side. And according to the design of a green sheet 301, the punch pin acceptance hole 105 which it pierces [hole] at the same time it makes the punch pin 220 pierce, and makes waste discharge penetrates in the part corresponding to a beer hall of a top face 102 up and down, and are prepared in it. [many] Let the punch pin acceptance hole 105 be the magnitude (diameter) which can be slid without a backlash corresponding to the diameter of each punch pin 220. However, it is formed so that the lower limit section of this punch pin acceptance hole 105 may make the countersinking-like taper section 106 in this example, and the minor diameter end face section of that taper section 106 pierces, and it considers as the trashy discharge side opening 110.

[0019] In this example, the silicone rubber layer 120 is attached in the crevice 104 of the inferior surface of tongue of a die 101 as a rubber-like elasticity object including this countersinking-like taper section 106. However, in this example, the penetration section (a through tube or break) 121 smaller than the tip (cross section) 221 of the punch pin 220 is formed in the location corresponding to the plane view (bottom face view) of the silicone rubber layer 120, and the discharge side opening 110 in the free condition. By this example, the rubber layer 120 is attached by making predetermined thickness apply and dry ****** style type liquefied silicone rubber (adhesion), it is after the attachment and the penetration section [a little] 121 smaller than the tip (field) 221 of a pin 220 is

formed by ******(ing) the punch pin 220. In addition, it is because it contracts in the free condition after a punch since it is extended and pierced so that it may be depressed caudad, in case the tip 221 of a pin 220 will collide with silicone rubber, if it ****** in this way that a little penetration section 121 smaller than the tip 221 of a pin 220 at this ****** can be formed, and it becomes small. In this way, the penetration section 121 is formed so that it may pass, as the tip 221 of the punch pin 220 extends.
[0020] On the other hand, the punch pin 220 which constitutes punch pin equipment 201 fixes so that it may correspond to the pin anchoring plate 230 through the upper limit section at arrangement of the beer hall of a sheet 301, and it is joined with a stripper 210 through a coil spring 240, and the pin anchoring plate 230 is constituted so that the punch pin 220 may slide the inside of a stripper's 210 punch pin guide hole 212 through a coil spring 240 (vertical movement). And such punch pin equipment 201 is constituted so that it may move up and down in one through the guide equipment and the press driving gear which are not illustrated.
[0021] In addition, in this example, when punch pin equipment 201 is located in upper limit, the space for the set of a green sheet 301 is secured between a stripper's 210 inferior surface of tongue 211, and the top face 102 of a die 101. Moreover, before carrying out lower ** (advance) of the punch pin equipment 201 (before punching), the tip (lower limit) 221 of the punch pin 220 is set up so that it may be located more nearly up than a stripper's 210 inferior surface of tongue 211. And if punch pin equipment 201 is lower-**(ed), the top face of the green sheet 301 set to the top face 102 of a die 101 on a stripper's 210 inferior surface of tongue 211 will be pressed down, a beer hall 303 will be pierced by coincidence in lower ** (advance) of the punch pin 220, but when the punch pin 220 is in the lowest edge, the tip 221 is set up so that a predetermined dimension protrusion may be carried out from the inferior surface of tongue 122 of the silicone rubber layer 120.
[0022] In order to punch a beer hall with such a punch, a sheet 301 is set to the top face 102 of a die 101 (positioning installation), and it lower-** so that punch pin equipment 201 may be dropped. Then, a coil spring 240 is compressed, and as shown in drawing 3 and 5, many beer halls 303 are pierced by the punch pin 220, at the same time a sheet 301 is pressed down on a stripper's 210 inferior surface of tongue 211, as shown in drawing 2 and 4. Under the present circumstances, as the penetration [in / by piercing waste 305 enters into the punch pin acceptance hole 105 with the punch pin 220, is extruded from the opening 110 for discharge (fall) of that bottom, and / the silicone rubber layer 120] section 121 pierced by the configuration at the tip (cross section) 221 of each punch pin 220 is extended with the tip of the punch pin 220, it passes.
[0023] As shown in drawing 5 at this time, when it pierces at the tip 221 of the punch pin 220 projected from the penetration section 121 of the silicone rubber layer 120 and waste 305 has adhered, the punch pin 220 is extracted in the contraction operation by that elasticity by the penetration section 121 of silicone rubber. Next, if upper ** (retreat) of the pin installation plate 230 is carried out under this condition, where a sheet 301 is pressed down by the stripper 210 this time, while a pin 220 is pulled out from a sheet 301, the lift of the punch pin equipment 201 will be carried out to a former location.
[0024] Although the tip 221 of a pin 220 tends to enter into the penetration section 121 of the silicone rubber layer 120 and tends to return to a former location when retreating (rise), upper ** 220, i.e., the punch pin, of this pin installation plate 230 By reaching the lower limit of the penetration section 121 of the silicone rubber layer 120, the blanking waste 305 which has adhered at the tip 221 is caught in resistance by the narrowing-down operation, or comes to be rubbed off relatively, and as shown in drawing 6 , from the tip 221 of a pin 220, it dissociates and it falls. That is, according to this example, even if it twists [adhere to the punch pin 220 separate and] and pierces and there is waste 305, separation fall can be automatically carried out at the retreat process of the punch pin 220. therefore, the hole of the beer hall [as / in the former] 303 -- it can prevent causing problems, such as plugging.
[0025] Even if it is raised a little and enters into the penetration section 121 of the silicone rubber layer 120 with a pin 220, without blanking waste 305 dissociating and falling in this way, the waste

305 will receive resistance by the rat tail and it in a contraction operation of the penetration section 121 of the silicone rubber layer 120. Therefore, without following retreat of the punch pin 220 as it is, as shown in drawing 7 in that case, since it dissociates and remains and only the punch pin 220 retreats in the penetration section 121, blanking waste 305 does not generate problems, such as hole plugging, in this case, either.

[0026] And at the time of punching of the following sheet 301, it extrudes together with the waste extruded at the tip 221 of the punch pin 220, and is separated by the contraction operation by the silicone rubber layer 120 the same with having described above in the retreat process of the pin 220 in that case, and the waste 305 which remains in this way falls. Thus, according to this example, it pierces at the retreat process of the punch pin 220 anyway, and problems, like waste 305 is caught in a beer hall 303 are not produced.

[0027] It is made to have not got down only to the middle in this invention so that I may be understood from having described above, without the tip 221 of the punch pin 220 passing the penetration section of rubber-like elasticity objects, such as a silicone rubber layer, at the time of the maximum descent (at the time of blanking). Even in such a case, it is because [which is not separated from the tip of a punch pin] it pierces and waste is not lifted as it is at the retreat process of a punch pin. But when a punch pin pierces a beer hall, it is desirable to make it the tip of this pin pass the penetration section of a rubber-like elasticity object. Moreover, it is desirable for the thickness of a rubber-like elasticity object to be also as large as possible, and to carry out. If thickness of a rubber-like elasticity object is enlarged, although it pierces at the retreat process of a pin and waste enters into the penetration section, it will pierce in it, waste will receive resistance for a long time, and it will be the part and because it is easy to dissociate.

[0028] In addition, although what pasted up and attached silicone rubber as a rubber-like elasticity object was illustrated in this example, in this invention, it is not limited to this. That is, it must be what can separate the blanking waste which has adhered at the tip of a pin in the elastic contraction operation thru/or a friction operation, and other rubber can be used. Moreover, you may be the resin object which has not only rubber but a moderate degree of hardness and elasticity as the above was also carried out.

[0029] Moreover, although wrote the rubber-like elasticity object as ****** style type liquefied silicone rubber, and it was made to paste up by making predetermined thickness apply and dry this and being attached with said gestalt, the rubber-like elasticity object which forms a solid-state is pasted up, or the proper fitting section is formed in a die, and as it fits in, you may attach. In addition, the penetration section may be prepared in any before and after attachment.

[Translation done.]